Zero Discharge Water Management for Horizontal Shale Gas Well Development

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Shale gas production depends on the creation of permeability within an otherwise nearly impermeable rock formation. Two technologies have been applied to produce natural gas – directional/horizontal drilling and massive hydraulic fracturing. Fracturing uses large volumes of water to create several, long fractures in the shale formation. Sand is pumped with the water and left to prop open the fractures, thus providing multiple, permeable flow paths for the natural gas. The use of the large volumes of water often stresses local fresh water supplies, and the water flowing back from the well after fracturing is a briny mixture, creating a water disposal problem. A West Virginia University (WVU) research team is looking at methods for managing frac water withdrawals and returns from large gas wells in the Marcellus Formation by converting the briny waste into a suitable, partial replacement of the fresh water that is currently used as the fracturing fluid of choice. The objective of this two-year, two-phase project is to develop and demonstrate a process for treating return frac water (RFW) from Marcellus horizontal well development that will allow an increased recycle rate while decreasing make-up water and disposal requirements.

Industry standards for acceptable recycle water quality standards continue to evolve with current primary needs of high-rate filtration operations achieving solids removal well below 20 microns and a reduction in sulfates and heavy metals. Industry also requires a treatment system with minimal operation and maintenance, occupies a small footprint, and can easily be taken from site to site. Phase I testing and review of treatment technologies identified a unique multi-media filter unit that met current industry needs.

This project is now well into Phase II, the design, fabrication and field deployment of a mobile treatment unit (MTU) to an active field site. The anticipated mobilization date is July 2011 with testing to run for 3 months. The successful development of a technology for treatment and reuse of RFW will advance shale gas development through improved economics and resolution of environmental impacts. Improved economics will be achieved by reducing the amount of trucking and disposal of RFW and costs associated with these activities. By reusing the RFW for subsequent fractures, the need for fresh water will be reduced. The better you treat the RFW, the higher the blend ratio with fresh water, the less dependence and strain on local water resources, and the less impact on local infrastructure and surrounding environment.